

> d abs ibib l4

L4 ANSWER 1 OF 1 CAPLUS COPYRIGHT 2003 ACS

AB The invention is an improved **fuel cell** system suited for application in a vehicle. Specifically, the invention provides an improved system to remove CO emissions that has a rapid dynamic response (about 1 s) and can operate over a wide range of temps. (between 0 and 800.degree.). The **fuel cell** system comprises hydrogen fuel, a CO removal system based upon non-Faradaic electrochem. modification of catalyst activity (**electrochem. promotion**), and a **fuel cell** stack. The CO removal system comprises a catalyst/**working electrode**, an electrolyte, a counter electrode, and a power source. The CO removal system's intrinsic catalytic rate is greater than an intrinsic electrocatalytic rate. The catalyst can be Pt, Rh, Au, Cu/ZnO, Cu/CuO, ABO<sub>3</sub> (perovskite), zeolite, and Pd. The power source can be a battery, potentiostat, or galvanostat.

ACCESSION NUMBER: 2002:850186 CAPLUS  
DOCUMENT NUMBER: 137:340035  
TITLE: **Fuel cell** power plant with electrochemical enhanced carbon monoxide removal  
INVENTOR(S): Ding, Yi; Burba, Joseph Carl  
PATENT ASSIGNEE(S): USA  
SOURCE: U.S. Pat. Appl. Publ., 7 pp.  
CODEN: USXXCO  
DOCUMENT TYPE: Patent  
LANGUAGE: English  
FAMILY ACC. NUM. COUNT: 1  
PATENT INFORMATION:

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
US 2002164507	A1	20021107	US 2001-848397	20010503
PRIORITY APPLN. INFO.:			US 2001-848397	20010503

=> s l3 and electrode  
367567 ELECTRODE  
275316 ELECTRODES  
476173 ELECTRODE  
(ELECTRODE OR ELECTRODES)

L5 9 L3 AND ELECTRODE

=> s l5 and catalyst  
610821 CATALYST  
596715 CATALYSTS  
779652 CATALYST  
(CATALYST OR CATALYSTS)

L6 7 L5 AND CATALYST

=> s l6 and platinum  
159071 PLATINUM  
49 PLATINUMS  
159081 PLATINUM  
(PLATINUM OR PLATINUMS)

L7 4 L6 AND PLATINUM

=> d abs ibib l7

L7 ANSWER 1 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The invention is an improved **fuel cell** system suited for application in a vehicle. Specifically, the invention provides an improved system to remove CO emissions that has a rapid dynamic response (about 1 s) and can operate over a wide range of temps. (between 0 and 800.degree.). The **fuel cell** system comprises hydrogen fuel, a CO removal system based upon non-Faradaic electrochem. modification of **catalyst** activity (**electrochem. promotion**), and a **fuel cell** stack. The CO removal system comprises a **catalyst/working electrode**, an electrolyte, a counter **electrode**, and a power source. The CO removal system's intrinsic catalytic rate is greater than an intrinsic electrocatalytic rate. The **catalyst** can be Pt, Rh, Au, Cu/ZnO, Cu/CuO, ABO<sub>3</sub> (perovskite), zeolite, and Pd. The power source can be a battery, potentiostat, or galvanostat.

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L7 ANSWER 2 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The **electrochem. promotion** of catalytic methane oxidn. was studied using a (CH<sub>4</sub>,O<sub>2</sub>,Ar),Pt|polybenzimidazole (PBI)-H<sub>3</sub>PO<sub>4</sub>|Pt, (H<sub>2</sub>,Ar) **fuel cell** at 135.degree.C. It has been found that C<sub>2</sub>H<sub>2</sub>, CO<sub>2</sub>, and water are the main oxidn. products. Without polarization the yield of C<sub>2</sub>H<sub>2</sub> was 0.9% and the yield of CO<sub>2</sub> was 7.3%. This means that C<sub>2</sub> open-circuit selectivity was approx. 11%. Open-circuit voltage was around 0.6 V. It has been shown that the CH<sub>4</sub>

C<sub>2</sub>H<sub>2</sub> catalytic reaction can be electrochem. promoted at neg. polarization and exhibits a clear "volcano-type" promotion behavior, meaning that there was

a max. promotion effect at a polarization of -0.15 V, or 0.45 V **catalyst** potential vs. a hydrogen **electrode** (3.8% C<sub>2</sub>H<sub>2</sub> yield). The catalytic rate enhancement ratio,  $r(C_2)/r_o(C_2)$ , at this max. was 4.2. There was no C<sub>2</sub>H<sub>2</sub> prodn. at polarization .gtoreq.0.1 and .ltoreq.-0.3 V. The yield of C<sub>2</sub>H<sub>2</sub> decreased with decreasing temp. Dependence of CO<sub>2</sub> yield on polarization also showed a "volcano-type" behavior with max. yield of 8.3% at -0.15 V polarization. The catalytic rate enhancement ratio for CO<sub>2</sub> prodn.,  $r(CO_2)/r_o(CO_2)$ , at this max. was 1.1, which means that this catalytic reaction is only slightly affected

by the electrochem. polarization. This indicates that polarization esp. affects the C<sub>2</sub> selectivity of the **catalyst**. The obtained data was explained by the electrochem. prodn. of Pt-H active centers at the electrolyte-**catalyst**-gaseous reactant interface ( $\lambda$ ..mchgt.1).

ACCESSION NUMBER: 2002:719553 CAPLUS  
TITLE: **Electrochemical Promotion of Oxidative Coupling of Methane on Platinum /Polybenzimidazole Catalyst**  
AUTHOR(S): Petrushina, I. M.; Bandur, V. A.; Bjerrum, N. J.; Cappeln, F.; Qingfeng, L.  
CORPORATE SOURCE: Department of Chemistry, Materials Science Group, Technical University of Denmark, Lyngby, DK-2800, Den.  
SOURCE: Journal of the Electrochemical Society (2002), 149(10), D143-D147  
CODEN: JESQAN; ISSN: 0013-4651  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 25 THERE ARE 25 CITED REFERENCES AVAILABLE FOR THIS

RECORD. ALL CITATIONS AVAILABLE IN THE RE  
FORMAT

L7 ANSWER 3 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The catalytic activity and selectivity of metals interfaced with solid electrolytes such as yttria-stabilized zirconia (YSZ), an O<sub>2</sub>- conductor or, .beta.-Al<sub>2</sub>O<sub>3</sub>, a Na<sup>+</sup> conductor, can be altered dramatically and reversibly via potential application. The increase in catalytic rate can

be several orders of magnitude higher than that anticipated from Faraday's Law. This new phenomenon of **electrochem. promotion** is of considerable theor. and potentially practical importance. The **electrochem. promotion** (or NEMCA) effect is described using ceramic H<sup>+</sup> conductors, such as CaZr<sub>0.9</sub>In<sub>0.1</sub>O<sub>3-a</sub>, and mixed ionic-electronic conductors such as TiO<sub>2</sub> and CeO<sub>2</sub>. The main phenomenol. features of **electrochem. promotion** are surveyed and the origin of the effect is discussed in view of recent surface spectroscopic and quantum mech. studies.

ACCESSION NUMBER: 1998:274489 CAPLUS  
DOCUMENT NUMBER: 129:59823  
TITLE: Non-faradaic electrochemical modification of catalytic activity using ionic and mixed conducting ceramics  
AUTHOR(S): Vayenas, C. G.; Bebelis, S.; Pliangos, C.; Petrolekas, P. D.; Makri, M.  
CORPORATE SOURCE: Department of Chemical Engineering, University of Patras, Patras, GR-26500, Greece  
SOURCE: Proceedings - Electrochemical Society (1998), 97-24 (Ionic and Mixed Conducting Ceramics), 509-529  
CODEN: PESODO; ISSN: 0161-6374  
PUBLISHER: Electrochemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 51 THERE ARE 51 CITED REFERENCES AVAILABLE FOR THIS

RECORD. ALL CITATIONS AVAILABLE IN THE RE

FORMAT

L7 ANSWER 4 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The authors report the 1st demonstration of non-Faradaic electrochem. modification of catalytic activity (NEMCA) for nonredox catalytic reactions, specifically the isomerization of alkenes on high surface area Pd/C or unsupported Pd-Ru cathodes interfaced to Nafion with a Pt-black/H<sub>2</sub> counter **electrode**. A Nafion electrolyte **fuel cell** assembly was used to study current-voltage and conversion-voltage relations in the isomerization of 1-butene to cis- and trans-2-butene. Alkene isomerization was not obsd. on Pd/C in the absence of Nafion. The unprecedented **electrochem. promotion** of the heterogeneous catalysis of alkene isomerization is demonstrated.

ACCESSION NUMBER: 1997:724013 CAPLUS  
DOCUMENT NUMBER: 128:54639  
TITLE: Proton spillover promoted isomerization of n-butylenes on Pd-black cathodes/Nafion 117  
AUTHOR(S): Ploense, Lloyd; Salazar, Maria; Gurau, Bogdan; Smotkin, E. S.  
CORPORATE SOURCE: Department of Chemical and Environmental Engineering, Illinois Institute of Technology, Chicago, IL, 60616, USA  
SOURCE: Journal of the American Chemical Society (1997), 119(47), 11550-11551  
CODEN: JACSAT; ISSN: 0002-7863  
PUBLISHER: American Chemical Society  
DOCUMENT TYPE: Journal  
LANGUAGE: English

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(FILE 'HOME' ENTERED AT 17:07:59 ON 17 JAN 2003)

FILE 'CAPLUS' ENTERED AT 17:08:05 ON 17 JAN 2003

L1 150 S ELECTROCHEMICAL PROMOTION  
L2 8563 S 1 AND (FUEL CELL)  
L3 13 S L1 AND (FUEL CELL)  
L4 1 S L3 AND (WORKING ELECTRODE)  
L5 9 S L3 AND ELECTRODE  
L6 7 S L5 AND CATALYST  
L7 4 S L6 AND PLATINUM

=> s l3 and co

706271 CO  
23427 COS  
726646 CO  
(CO OR COS)

L8 5 L3 AND CO

=> s l8 and catalyst

610821 CATALYST  
596715 CATALYSTS  
779652 CATALYST  
(CATALYST OR CATALYSTS)

L9 4 L8 AND CATALYST

=> d abs ibib l9 1-4

L9 ANSWER 1 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The invention is an improved **fuel cell** system suited for application in a vehicle. Specifically, the invention provides an improved system to remove **CO** emissions that has a rapid dynamic response (about 1 s) and can operate over a wide range of temps. (between 0 and 800.degree.). The **fuel cell** system comprises hydrogen fuel, a **CO** removal system based upon non-Faradaic electrochem. modification of **catalyst** activity (**electrochem. promotion**), and a **fuel cell** stack. The **CO** removal system comprises a **catalyst**/working electrode, an electrolyte, a counter electrode, and a power source. The **CO** removal system's intrinsic catalytic rate is greater than an intrinsic electrocatalytic rate. The **catalyst** can be Pt, Rh, Au, Cu/ZnO, Cu/CuO, ABO<sub>3</sub> (perovskite), zeolite, and Pd. The power source can be a battery, potentiostat, or galvanostat.

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CODEN: USXXCO

DOCUMENT TYPE: Patent

LANGUAGE: English

FAMILY ACC. NUM. COUNT: 1

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PRIORITY APPLN. INFO.:			US 2001-848397	20010503

L9 ANSWER 2 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The hydrogen-rich reformat used as a feed to polymer electrolyte **fuel cells** must contain less than 10 ppm CO since it poisons the Pt anode. The concn. of CO leaving the water-gas shift reactor is typically around 1 mol%, which is set by thermodyn. equil. One method to remove the CO is by preferential oxidn. by using O2 over a (typically) Pt **catalyst** while minimizing the amt. of H2 oxidized. The activity and selectivity of this reaction were improved by a new pretreatment method for a 5 wt% Pt/.gamma.-Al2O3 **catalyst**. The pretreatment involved satg. the reduced **catalyst** with water and allowing it to vaporize during redn. The improvement is attributed to a redn. in size of the metallic

Pt

particles as measured by XRD and TEM.

ACCESSION NUMBER: 2002:651497 CAPLUS

DOCUMENT NUMBER: 138:41895

TITLE: Promotion of Pt/.gamma.-Al2O3 by new pretreatment for low-temperature preferential oxidation of CO in H2 for PEM **fuel cells**

AUTHOR(S): Son, I. H.; Shamsuzzoha, M.; Lane, A. M.

CORPORATE SOURCE: Department of Chemical Engineering, University of Alabama, Tuscaloosa, AL, 35487, USA

SOURCE: Journal of Catalysis (2002), 210(2), 460-465  
CODEN: JCTLA5; ISSN: 0021-9517

PUBLISHER: Elsevier Science

DOCUMENT TYPE: Journal

LANGUAGE: English

REFERENCE COUNT: 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS

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FORMAT

L9 ANSWER 3 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The Pd-catalyzed NO-CO reaction at 320-480.degree. exhibited **electrochem. promotion**. This reaction was performed in a **fuel-cell** configuration where Pd is coated on Y2O3-stabilized ZrO2. The **electrochem. promotion** of the catalytic activity and modification of the selectivity to N2O is reversible and this system showed both electrophilicity and electrophobicity, depending on the direction of oxygen ion pumping. In a typical expt., the enhancement of reaction rate is 100 times greater than the rate of oxygen ion removal from the **catalyst** electrode. Rate enhancement, which is defined as the ratio of the reaction rate

under

electrochem. oxygen removal to the rate under open circuit, of .rho.CO2 = 2.2, .rho.N2O = 2.2 and .rho.N2 = 4.2 were measured for VWR = -1.8 V at 370.degree..

ACCESSION NUMBER: 2001:57507 CAPLUS

DOCUMENT NUMBER: 134:138342

TITLE: Solid electrolyte aided studies of NO-CO reaction on Pd

AUTHOR(S): Kim, Soonho; Haller, Gary L.

CORPORATE SOURCE: Electrochemistry Laboratory, Samsung Advanced Institute of Technology, Suwon, 440-600, S. Korea

SOURCE: Solid State Ionics (2000), 136-137, 693-697

CODEN: SSIOD3; ISSN: 0167-2738  
PUBLISHER: Elsevier Science B.V.  
DOCUMENT TYPE: Journal  
LANGUAGE: English  
REFERENCE COUNT: 11 THERE ARE 11 CITED REFERENCES AVAILABLE FOR  
THIS

RECORD. ALL CITATIONS AVAILABLE IN THE RE  
FORMAT

L9 ANSWER 4 OF 4 CAPLUS COPYRIGHT 2003 ACS

AB The kinetics of the steam reforming reaction of CH<sub>4</sub> were investigated at  
temps. 750 to 950.degree. under both open-circuit and closed-circuit  
conditions on Ni-YSZ solid oxide **fuel cell** (SOFC)  
anodes and polycryst. Ni film SOFC anodes of measured Ni surface area.

It was found that the rate of methane reforming on the Ni surface exhibits a  
Langmuir-Hinshelwood type dependence on PCH<sub>4</sub> and PH<sub>2</sub>O which results from  
competitive adsorption of carbonaceous species and oxygen or OH.  
Consequently the rate is maximized for intermediate PCH<sub>4</sub> to PH<sub>2</sub>O ratios.  
The reaction kinetics are affected significantly by cell current and  
potential under closed-circuit conditions. Over a rather wide range of  
operating conditions the obsd. rate changes are Faradaic, which implies  
negligible variation in the catalytic properties of the Ni surface with  
potential. At lower temps., however, and particularly under conditions

of carbon deposition, the rates of CO, H<sub>2</sub>, CO<sub>2</sub> and, more  
importantly, carbon formation exhibit pronounced non-Faradaic, or  
**electrochem. promotion**, behavior. Some non-Faradaic  
behavior is also obsd. for higher H<sub>2</sub>O to CH<sub>4</sub> ratios but in this case the  
effect of applied potential is reproducible but not readily reversible.

ACCESSION NUMBER: 1998:174766 CAPLUS  
DOCUMENT NUMBER: 128:206778  
TITLE: Catalysis, electrocatalysis and  
**electrochemical promotion** of the  
steam reforming of methane over Ni film and Ni-YSZ  
cermet anodes  
AUTHOR(S): Yentekakis, I. V.; Jiang, Y.; Neophytides, S.;  
Bebelis, S.; Vayenas, C. G.  
CORPORATE SOURCE: Department of Chemical Engineering, University of  
Patras, Patras, GR-26500, Greece  
SOURCE: Ionics (1995), 1(5 & 6), 491-498  
CODEN: IONIFA; ISSN: 0947-7047  
PUBLISHER: Institute for Ionics  
DOCUMENT TYPE: Journal  
LANGUAGE: English

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L7 4 S L6 AND PLATINUM  
L8 5 S L3 AND CO

L9

4 S L8 AND CATALYST

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